

A NEW RECORD AND A NEW SPECIES OF LANTERNFISH,
GENUS *DIAPHUS* (FAMILY MYCTOPHIDAE),
FROM THE NORTH ATLANTIC OCEAN¹

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ABSTRACT: *Diaphus adenomus* Gilbert, 1905, heretofore known only from off Hawaii and southern Japan, is recorded from the North Atlantic. A new species, *Diaphus roei*, is described on the basis of numerous specimens all caught in the vicinity of the Caribbean Islands. The new species is closely related to *D. effulgens*, from which it is distinguished by its lack of an Ant luminous organ, the higher position of its PLO and SAO₃, and its higher gill raker counts (22-25 vs 19-22). The two forms reported herein raise the number of species of *Diaphus* in the North Atlantic to 23.

The purpose of this paper is to update the work of Nafpaktitis (1968) on the genus *Diaphus* in the North Atlantic. Two additional species belonging to this large and complex genus have been found in the course of a more recent investigation on the myctophids of the western North Atlantic. Of the two, one is a new and rather startling record of *D. adenomus* Gilbert, 1905, until now known only from the Hawaiian Islands and from off southern Japan. The other is a new species. The two additions bring the total number of species of *Diaphus* in the North Atlantic to 23, which constitutes approximately 26 per cent of the entire myctophid fauna in that ocean.

Diaphus adenomus Gilbert

Figure 1

Diaphus adenomus Gilbert, 1905: 592, Pl. 68, fig. 1; type locality, the Kaiwi Channel between Oahu and Molokai, Hawaii, 335 to 350 fms; holotype USNM 51588.

Diaphus anteorbitalis Gilbert, 1913: 92, Pl. 12, fig. 1; type locality, off Shiwo Misako, 33°24'50"N, 135°38'40"E, 253 fms; holotype, USNM 74471.

Distinctive characters. *D. adenomus* is easily distinguished from all other North Atlantic members of the genus by the large luminous organs around the eye, especially the long supraorbital organ that extends along most of the dorsal orbital margin.

Description. D. 15 (14); A. 15 (16); P. 12 (11); V. 8; gill rakers on first

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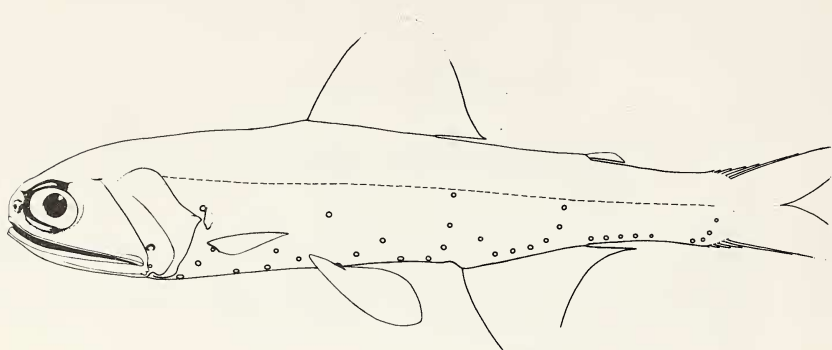


FIGURE 1. *Diaphus adenomus*. Young individual, 96.0 mm SL; R/V Oregon station 3616, off Nicaragua (Caribbean).

arch $5 + 1 + 11$; AO $6 (7) + 5(4-6)$, total 11 (12); lateral line scales 37.

One of the largest members of the genus. Mouth large, terminal, its cleft oblique; length of upper jaw 1.3 to 1.4 in length of head and extending 1 to 1.3 times the diameter of eye behind vertical through posterior margin of orbit. Eye large, its diameter 2.4 to 3 in length of upper jaw and 3.2 to 4 in length of head. Operculum tapering posteriorly to a point at or slightly below PLO. Pterotic spine prominent, sharp.

Origin of dorsal fin over base of ventral fin. Origin of anal fin behind vertical through end of base of dorsal fin. Pectoral fin short, extending to, or somewhat beyond PO_4 . Base of adipose fin somewhat in advance of vertical through end of base of anal fin.

A small, shallow Dn. Vn extending along ventral and anterior border of orbit, to level of Dn. A supraorbital organ, similar in form to Vn, between eye and supraorbital frontal ridge. Both Vn and supraorbital organs framed by black tissue, and extending posteriorly to about vertical through center of lens in specimens smaller than 95 mm SL, reaching vertical through posterior margin of lens in larger individuals.

PLO midway between base of pectoral fin and lateral line or somewhat higher. VLO midway between base of ventral fin and lateral line or slightly higher. SAO on a straight or very nearly straight, subvertical line; SAO_1 well above and behind VO_5 ; SAO_3 in advance of vertical through origin of anal fin and about its own diameter below lateral line. First AOa highly elevated, the series forming a trough continuous posteriorly with PO_1 which is 1.5 to 2 times its own diameter below lateral line. AOp evenly spaced, level, with AOp₁ behind, seldom over, end of base of anal fin. Prc evenly spaced, forming a gentle curve; Prc₄ 3 to 4 times its own diameter below lateral line.

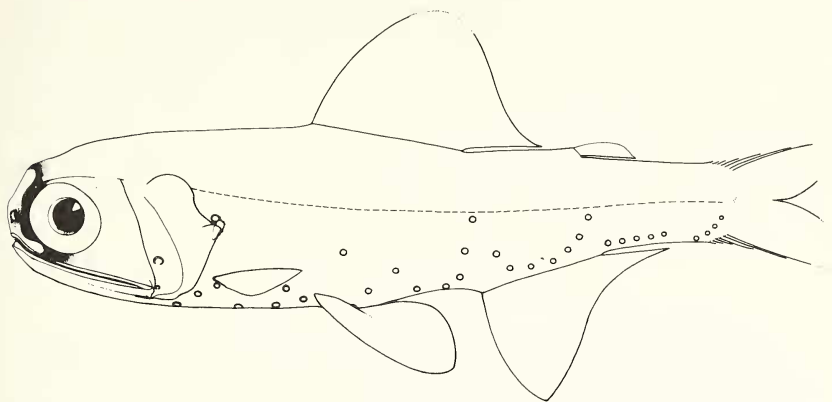


FIGURE 2. *Diaphus roei*. Holotype; 89.0 mm SL; USNM 210553.

A vertically elongate luminous scale at PLO.

Size. The 62 North Atlantic specimens examined measured 61.5–181 mm SL; no gravid female was found among them.

Range. *D. adenomus* has so far been taken close to the bottom, on or near continental and island shelves in the Caribbean Sea and the waters off the Bahamas. The only record from the eastern North Atlantic is that from off Casablanca, Morocco.

Remarks. Eight years after he described *D. adenomus* from Hawaiian waters, Gilbert (1913) described another myctophid from off southeastern Japan under the name *Diaphus anteorbitalis*. Gilbert himself admitted that *D. anteorbitalis* was “very closely allied to *D. adenomus* . . . differing only in the greater development of the circumocular luminous bodies, in the slightly higher position of the suprapectoral photophore (= PLO), and in the larger eye” (Gilbert, 1913:92). I have examined the type material of both species and I fully agree with Parr (1929:41) that there is no difference in the development of the circumorbital luminous organs between the two forms. The difference in the position of the PLO between the two forms is insignificant, and so is the difference in the size of the eye. Consequently, *D. anteorbitalis* is placed in the synonymy of *D. adenomus*.

Material examined. Except for two specimens (132.0–139.0 mm SL) caught with an otter trawl at a depth of 600 m off Casablanca, Morocco, and kindly sent to me by Charles L. Brownell of the Institut des Peches Maritimes du Maroc, all of the material examined was collected by the National Marine Fisheries Service vessels *Oregon*, *Oregon II*, and *Silver Bay*. The available data for the latter are as follows: 50 (61.5–118.0 mm), *Oregon* sta. 3616, off

Nicaragua (Caribbean); 3 (121.0–181.0 mm), *Oregon II* sta. 10268, 12 March 1968, 11°26'N, 74°14'W, 315 fms, 71' shrimp trawl; 1 (147.0 mm), *Oregon II* sta. 10839, 12 July 1969, 17°37'N, 63°00'W, 360 fms, 40' shrimp trawl; 2 (89.5–97.0 mm), *Oregon II* sta. 11585, 10 March 1971, 29°15'N, 87°58'W, 160 fms, 71' shrimp trawl; 3 (134.0–155.0 mm), *Silver Bay* sta. 3500, northeast of Bahamas; 1 (72.0 mm), *Silver Bay* sta. 5161, 14 October 1963, 19°57'N, 71°05'W, 170 fms, 50' shrimp trawl.

The above material is deposited at the Natural History Museum of Los Angeles County (LACM).

***Diaphus roei*, new species**

Figure 2

Holotype. A male, 89.0 mm SL, National Marine Fisheries Service (NMFS) vessel *Oregon* sta. 5072, 17°20'N, 62°52'W, 3 September 1964, 1630 hrs, 305 fms, 40' shrimp trawl; USNM 210553.

Paratypes. A male, 89.0 mm SL, data as for holotype, LACM 33704-1; a male, 89.0 mm SL, Museum of Comparative Zoology, Harvard University, MCZ 49100, and a female, 104.0 mm SL, MCZ 49101, data for both as for holotype; a male, 89.0 mm SL, USNM 210554, and a female, 98.5 mm SL, USNM 210555, NMFS vessel *Silver Bay* sta. 5161, 19°57'N, 71°05'W, 14 October 1963, 1650 hrs, 170 fms, 50' shrimp trawl; two females, 94.0 and 103.0 mm, LACM 33705-1 and 33705-2, respectively, NMFS vessel *Silver Bay* sta. 5161, data as above.

Thirty-five additional specimens, 68.0–108.0 mm SL, were examined. These are deposited at the LACM.

Diagnosis. The high position of the PLO and SAO₃, the absence of Ant, and the high gill raker count will separate this fish from its closest relative, *D. effulgens*.

Description. Counts are from 43 specimens. Proportional measurements, expressed in percent of SL, are based on 20 specimens, 68.0–104.0 mm SL; initial values are arithmetic means, values in parentheses represent the range of variation.

D. 15; A. 14 (13); P. 11 (12); V. 8; gill rakers on first arch 7 (6–8) + 1 + 15–16, total 23–24 (22–25); AO 6 + 5 (4–6), total 11 (10–12); lateral line scales 36.

Length of head 30.8 (29.4–32.0); depth of head 24.2 (23.0–25.0); length of upper jaw 21.9 (21.0–22.5); horizontal diameter of eye 10.8 (10.4–11.2).

Distance from tip of snout to: origin of dorsal fin 44.2 (43.0–45.0); origin of anal fin 66.8 (65.5–68.0); base of adipose fin 80.9 (79.4–82.0); base of pectoral fin 30.6 (29.0–31.5); base of ventral fin 45.8 (44.8–46.7).

A large *Diaphus*. Head large. Snout high, bluntly rounded and slightly overhanging mouth. Mouth large, oblique; length of upper jaw 1.3 to 1.4 in length of head and extending 0.6 to 0.8 of the diameter of eye behind vertical through posterior margin or orbit. Eye very large, its horizontal diameter 1.9 to 2.1 in length of upper jaw and 2.7 to 3 in length of head. Operculum tapering posteriorly to a point somewhat below PLO.

Origin of dorsal fin slightly in advance of base of ventral fin. Origin of anal fin behind end of base of dorsal fin. Pectoral fin not reaching base of ventral fin. Ventral fin reaching origin of anal fin in specimens smaller than about 90 mm SL, somewhat shorter in larger individuals. Base of adipose fin in advance of vertical through end of base of anal fin.

Dn very large, directed forward, its medial side in contact with median ethmoid crest, and extending higher than dorsal margin of orbit. Vn also very large and massive, occupying nearly entire lower half of snout, reaching ethmoid crest dorsad to olfactory organ, continuing along anteroventral border of orbit, terminating at or slightly behind vertical through anterior margin of pupil. Dn and Vn in contact with each other above olfactory organ. Ant absent.

PLO nearer to lateral line than to base of pectoral fin; distance between PLO and base of pectoral fin 2 to 3 times as long as that between PLO and lateral line. VLO midway between base of ventral fin and lateral line or a little lower. SAO on a straight or very nearly straight, subvertical line; SAO₁ well above and behind VO₅; SAO₃ slightly in advance of vertical through origin of anal fin and immediately, or less than its own diameter, below lateral line. AOa forming a deep trough with first, fifth and sixth AOa elevated. Pol 1 to 1.5 times its own diameter below lateral line and nearly continuous with AOa. AOp behind base of anal fin, evenly spaced and level. Prc forming a gentle, ascending curve, with Prc₁, 2 to 3 times its own diameter below lateral line.

A small luminous scale at PLO.

Size. The largest specimen found in the collections examined measured 108.0 mm SL and was one of two gravid females; the other was 104.0 mm SL, which indicates that in the North Atlantic this species spawns at a size considerably smaller than its apparently closest relative, *D. effulgens*.

Range. So far *D. roei* is known only from off the leeward islands of the Lesser Antilles, from northeast of Puerto Rico, and from off the north coast of the Dominican Republic.

Name. The species is named after Richard B. Roe of the NMFS, Southeast Fisheries Center, Pascagoula, Mississippi.

DISCUSSION

The two species discussed in this paper bring the total number of species of the genus *Diaphus* in the North Atlantic to 23. Of these, only six (*dumerili*, *liitkeni*, *lucidus*, *effulgens*, *mollis*, and *subtilis*) are known to be rather uniformly distributed across the ocean. Five (*splendidus*, *termophilus*, *fragilis*, *elucens*, and *brachycephalus*), though collected across the ocean, appear to be much more abundant in the western than in the eastern part; and six (*garmani*, *problematicus*, *bertelseni*, *minax*, *anderseni*, and *roei*) have so far been reported only from the western part of the North Atlantic. "Western part" is here considered the area of the ocean to the west of the mid-Atlantic ridge, including the Caribbean Sea and the Gulf of Mexico.

Of the remaining six species, two (*vanhoeffeni* and *holti*) are known only from the eastern North Atlantic, that is east of the mid-Atlantic ridge; two (*metopoclampus* and *rafinesquei*), though found across the ocean, are relatively more abundant in the eastern than in the western part; and two (*taaningi* and *adenomus*) occur as disjunct populations on both sides of the ocean. Finally, the eastern *holti* and the "mainly eastern" *metopoclampus* and *rafinesquei* are all found in the Mediterranean Sea.

It is obvious from the above data that there is a marked difference not only in the number of species but also in the relative abundance of a number of species between the western and the eastern North Atlantic. There are three times as many western as there are eastern species, and more than twice as many "mainly western" as there are "mainly eastern" ones. Studies currently in progress indicate that other myctophid genera show very much the same distributional pattern.

These faunal differences between the eastern and western North Atlantic may be attributed to a number of factors, primarily circulation, distribution of land masses, biology and vertical distribution of the animals involved, and more intensive sampling in the western part of the ocean than the eastern part. However, a serious attempt to explain the phenomenon must wait until we know a great deal more about the composition and distribution of the myctophid fauna in the South Atlantic.

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LITERATURE CITED

- GILBERT, C. H. 1905. The deep-sea fishes of the Hawaiian Islands. U. S. Fish Comm. Bull. 23 (II).
———. 1913. The Lantern-Fishes of Japan. Mem. Carnegie Mus. 6 (2).
NAFAKITIS, B. G. 1968. Taxonomy and distribution of the lanternfishes, genera *Lobianchia* and *Diaphus* in the North Atlantic. Dana Report 73.
PARR, A. E. 1929. Notes on the species of myctophine fishes represented by type specimens in the United States National Museum. Proc. U. S. Natl. Mus. 76:1-47.

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